

Pandemic Influenza: New Rules for the 21st Century

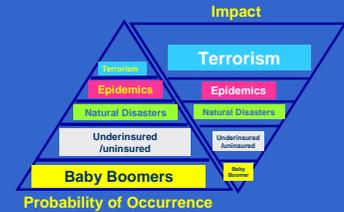


Peter Katona, MD

Why New Rules?

- The virus is changing
- Our enemies are gaining the ability to manipulate biological organisms to terrorize us
- The world is a “smaller” place
- The world is more interconnected
- We have the ability to make tools like never before

Current Threats to the Medical System

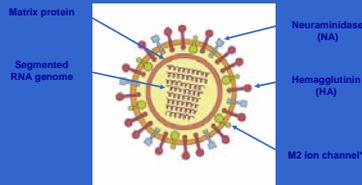


Influenza virus



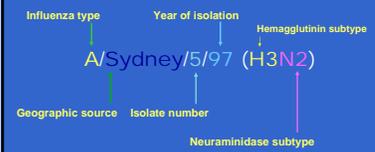
- Single-stranded RNA orthomyxoviruses
- Originate in fowl
- Influenza A and B
- Enveloped and pleomorphic
- 8 gene segments code for 10 proteins
- RNA exhibits high mutation rates

Schematic of Influenza A Virus



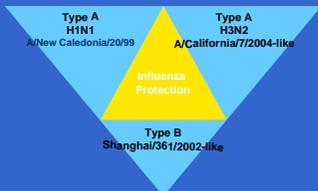
*Influenza type B virus has a different ion channel protein

World Health Organization Influenza Nomenclature



Influenza type B does not occur as subtypes.

Influenza Vaccine: A Trivalent Defense



Influenza: The Background

- Roots come from the Latin term for “poison”
- From poisons, it went to myasmas, life forms, then biological “chemicals”
- Now we know it is a living, contagious, highly mutating set of RNA viruses that cause both respiratory & GI disease

Why worry about influenza?

- It's not exotic
- All of you have had it
- All of you survived
- It's not on CDC's biothreat list
- Are the concerns about avian flu more theoretical than practical?



Why worry about avian flu?

- There are very few human cases worldwide and none here in the US
- No clear evidence of human-to-human transmission
- It hasn't done any serious harm here
- There are drugs to treat it and vaccines to prevent it are coming
- Who cares about chickens anyway?

11

Nonetheless, there are concerns

- Of the 1,415 microbes known to cause human disease, flu has killed more people than any other infectious agent
- It's more contagious than smallpox
- It can easily mutate
- We still make vaccine on individual eggs rather than cell culture and the vaccine has to be reformulated every year
- Disease in fowl is spreading rapidly

12

CDC's prediction for a "medium level epidemic" of flu

- 207,000 American deaths
- 734,000 hospitalizations
- 1/3 of the entire US population affected
- Direct medical costs of \$166 billion not including the cost of vaccination
- It has been 36 years since the last pandemic!!!



13

The Biggest Infectious Disease Events of the 20th Century

- Eradication of Smallpox
- Discovery of Penicillin
- Emergence of HIV/AIDS
- Childhood immunization
- The emergence of bioterrorism
- Pandemic flu of 1918 - 1919

14

Morbidity & Mortality in the United States

- 50-60 million infections and illnesses
- 25 million physician visits
 - mostly by school-aged children and young adults
- 114,000 – 142,000 hospitalizations
 - rates highest in very young and elderly
- 20,000 – 40,000 direct deaths
 - influenza-pneumonia mortality highest in elderly
 - up to 51,000 when flu-related complications, like heart attacks and strokes, are included
- \$10 billion including \$1-3 billion for direct medical costs

and lots of worry

15

Flu is an excellent model for any pandemic event such as a bioterror attack



16

And there's more

- In 20th century pandemics, a second wave of influenza activity occurred 3 to 12 months after the first wave
- The pandemic will last much longer than most other emergency events

17

Pandemics & Health Care Workers

- HCWs and first responders available to work will be reduced
- They will be at high risk of illness through exposure in the community and in health-care settings
- Some will miss work to care for ill family members.
- Some will head for the hills

18

How do we track flu?



19

FIGURE 2. Percentage of deaths attributed to pneumonia and influenza (P&I) reported by the 122 Cities Mortality Reporting System, by week and year — United States, 2002–2006

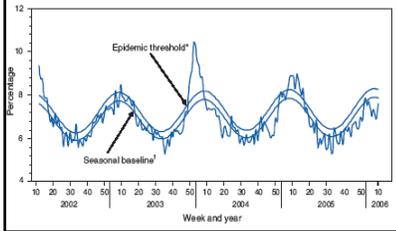
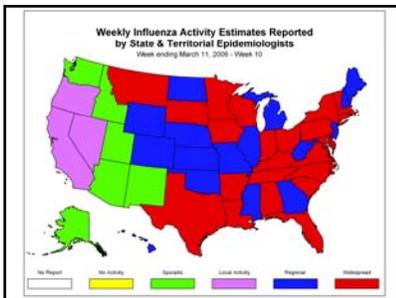
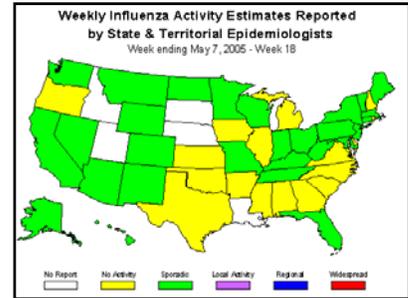
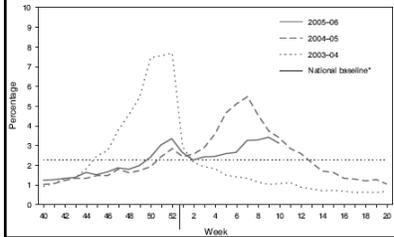
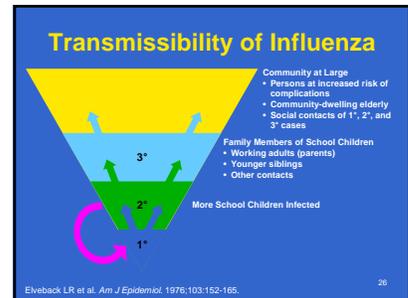


FIGURE 3. Percentage of visits for influenza-like illness (ILI) reported by the Sentinel Provider Surveillance Network, by week — United States, 2003–04, 2004–05, and 2005–06 influenza seasons



Global Outbreak Alert & Response Network

- A technical collaboration of existing institutions and networks who pool human and technical resources for the rapid identification, confirmation and response to outbreaks of international importance
- It provides an operational framework to link this expertise and skill to keep the international community constantly alert to the threat of outbreaks and ready to respond.

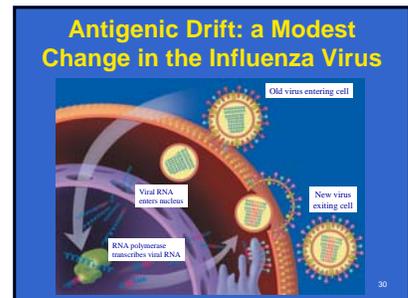


What's important in transmission?

- Vaccine
 - Supply and recent shortage
 - Vaccination rate & appropriateness
- The Bug
 - Prevalence
 - Virulence
 - Contagiousness
 - Susceptibility to vaccine and anti-virals
- The Person
 - Hygiene
 - Age
 - Immune status
- What they do/don't do over there in China

Influenza Epidemics and Pandemics

- Caused by influenza A only (B causes milder disease)
- In "**epidemic**" years, 10% - 20% of world's population gets influenza with 500,000 to 1,000,000 deaths worldwide
- Caused by genetic "**drifts**" or point mutations in gene segments: H1 → H1
- In "**pandemic**" years, over 25% of world's population gets influenza with disproportionate worldwide deaths
- Caused by genetic "**shifts**" with complete substitutions of gene segments: H1 → H5



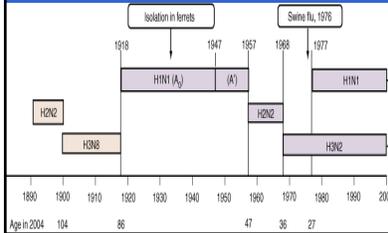
Antigenic Shift

- Influenza type A only
- **Profound** variation in hemagglutinin or neuraminidase structure
 - reassortment of genomic material
- **New virus with novel antigenic profile**
 - compromised vaccine and immune system efficacy
- **Pandemic** consequences

Cox NJ, Subbarao K. Lancet. 1999;354:1277-1282.

31

Pandemics of influenza



33

There is a flu **pandemic** about once every generation; but the last was in 1968. So we are overdue!

Transmission of avian flu

- **Direct or indirect contact of domestic flocks with wild migratory waterfowl**
- **Live bird markets**

but if it became contagious between humans...

34

With this in mind consider

- There are 40,000 droplets from a single cough
- In a pandemic, quarantine will be used despite the fact that there is little evidence that it ever slowed the spread of flu
- On April 1, 2005 President Bush issued an executive order authorizing the use of quarantines inside the US and permitting the isolation of int'l visitors suspected of carrying influenza

35

Quarantine

To the **Marines**, securing a building means killing everybody inside and blowing it up.

To the **Army**, securing a building means putting a fence around it and not letting anybody else in.

To the **Navy**, securing a building means turning the lights off and locking the door as you leave.

To the **Air Force**, securing a building means negotiating a 15 year lease with an option to extend.

36

The History of Flu



37

Influenza Pre-20th Century

- 2,500 BC - domestication of ducks, bringing influenza close to human beings
- 412 BC - Hippocrates described a disease that is probably influenza
- 1580 – 1st recorded pandemic: an outbreak in Europe, Africa & Asia
- 1889 - Unknown influenza subtype (probably Russian flu) began in Central Asia & spread to Russia and other parts of the world.

38

Medical care before the 20th Century

- No good knowledge of chemistry
- No autopsy
- Doubted germ theory
- No infection control
- Muttered about miasmas*

*A disease-causing noxious or poisonous or thick vaporous or emanation in the atmosphere formerly thought to rise from swamps and putrid matter

39

Pre-avian Influenza in the 20th Century

- 1918 - Spanish flu **H1N1** (swine flu) killed 20 - 40 million people worldwide, more than on the battlefields of WWI
- 1930 - **H1N1** first isolated
- 1957 - Asian flu **H2N2** pandemic started in China and killed 70,000 in the US
- 1968 - Hong Kong **H3N2** pandemic killed 34,000 in the US
- 1976 - Swine flu scare

40

The Spanish Flu

- Duration: summer 1918 - spring 1919 (10 months)
- 675,000 deaths in the US (equivalent to 1.7 million today)
- 50 - 100 million killed worldwide (equivalent to 175-350 million today)

Why Spanish and not Chinese or American?

The name "Spanish Flu" came from the early affliction and large mortalities in Spain where it allegedly killed 8 million in one month alone.



42

Spanish Flu Caused



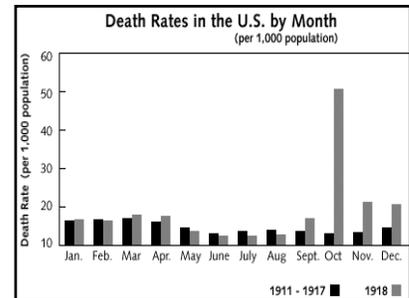
- Quarantines
- School closures
- Factory shutdowns
- Cancellation of Liberty Bond marches
- Disruption of the war effort
- US response = Chinese SARS response

43

This was no small event

- The average life span in the US decreased by 10 years
- The mortality rate was 2.5% vs. <.1% for normal influenza epidemics
- The flu-pneumonia death rate for 15 to 34-year-olds was 20x higher in 1918 than in previous years
- People were struck with illness on the street and died very rapid deaths

44



And

- Spanish flu infected 28% of all Americans
- There were 10x as many deaths as in WW1
- In Europe half of U.S. soldiers and ~43,000 US servicemen mobilized for WWI died of influenza
- By October, 46% of the French army was off the field ailing, dying or caring for flu victims
- Military death tolls ranged from 5-10%

46

President Wilson, fixated on events on the Western Front, didn't delay the voyages of troop ships to France, even though jamming thousands of soldiers into fetid quarters guaranteed the spread of disease and the deaths of thousands.



47

And after our soldiers arrived in Europe they were put into crowded trenches and foxholes



48

It was thought that during WWI, the failure of the major German offensive was not because of the influx of fresh American troops but by the diminished strength of the German army attributed partly to influenza!



49

Why was the Spanish flu so deadly?

- There was a direct toxic insult: a cytokine storm
- This resulted in ARDS, not secondary bacterial pneumonia
- Even antibiotics wouldn't have helped
- Medical histories of the victims of avian flu are disturbingly similar to accounts of Spanish flu!

50

76% of pregnant women who got infected with Spanish flu died!!!!



51

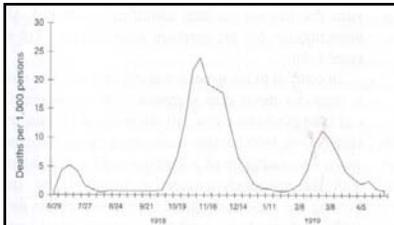


Figure 1. Three pandemic waves: weekly combined influenza and pneumonia mortality, United Kingdom, 1918–1919 (21).

- Normally flu kills the very young and the very old.

Spanish flu killed people in their 20s and 30s - in the prime of life!

53

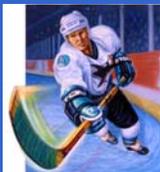
Would things be different now?

- We have antibiotics for secondary infections
- A distribution system exists
- There are worldwide warning stations
- Effective vaccines and anti-viral medications exist

Maybe

54

What does influenza have in common with professional hockey?

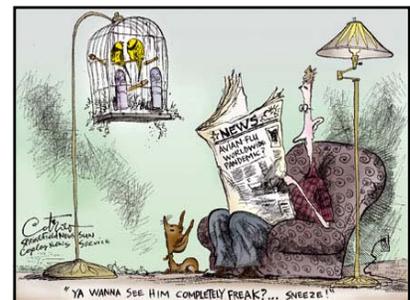


55

Because it was difficult to find grave diggers, many who died were buried in mass graves



56

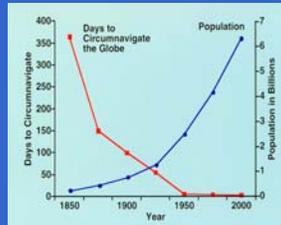


Flu: Then and Now

- | | |
|--|--|
| <p>1918</p> <ul style="list-style-type: none"> Hospitals, nurses and doctors and care-givers Few int'l organizations Much less media Much less travel There were less people | <p>2005</p> <ul style="list-style-type: none"> Antibiotics, antivirals, and maybe a vaccine International, national and community organizations Able to follow the global progress of the disease through the media There are more of us, crowded into much bigger cities People traverse the globe in a day, bringing goods, services, information, capital—and, in some cases, viruses |
|--|--|

58

How Fast Can a Pandemic Spread?



59

A very stupid mistake

- In October 2004 the American College of Pathologists mailed a collection of mystery microbes prepared by a private lab to almost 5,000 labs in 18 countries as part of recertification
- In March 2005 a Canadian lab discovered that the kits contained live H2N2 Asian flu virus

60

The H2N2 strain

- Hasn't been in circulation since 1968 so most of us have no immunity
- In 1957 it killed 4 million people
- If it got out accidentally or intentionally, it would be a disaster
- WHO called for the immediate destruction of the test kits
- We are unaware of any missing samples

61

Can we learn anything from history?

- Mad cow disease started when British farmers started to feed sheep byproducts infected with scrapie to their cattle in the 1980s
- Nipah virus started in Malaysia in 1998 by handling infected pigs which got the disease from bats feeding in fruit trees of new pig farms
- Bird flu cases are associated with proximity to chickens

62

What's happened since 9-11?

- Anthrax letters
- Invasion of Afghanistan
- Patriot Act
- Department of Homeland Security
- Occupation of Iraq
- Stricter Immigration laws
- EMERGENCE OF AVIAN FLU



Avian Influenza (bird flu)



H5N1 (avian flu) virus constitutes the single greatest threat to the world at present.

Julie Gerberding
CDC Director

Bird flu: No, we're not talking about Larry Bird getting sick



67

We worry

- Convergence
 - Virulence
 - Drug or vaccine resistance
 - Transmissibility or contagiousness
 - Species-to-species
 - Human-to-human
- It is currently stable but could become very unstable at any time
 - antigenic drift
 - antigenic shift

68

HUMAN CASES OF BIRD FLU

19 March 2006

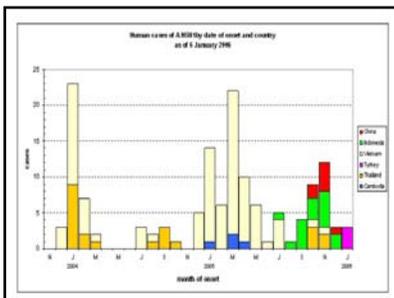
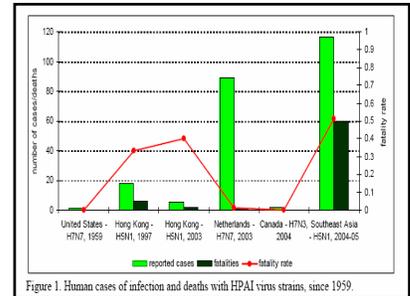
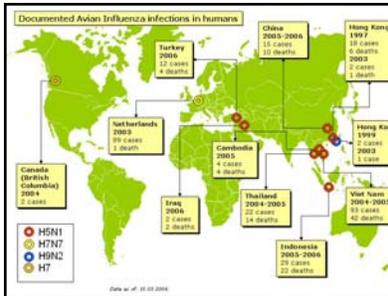
Country	Cases	Deaths
Cambodia	4	4
China	15	10
Hongkong	28	21
India	2	2
Thailand	22	14
Turkey	12	4
Vietnam	93	62
Total	176	97

Source: World Health Organization

Avian Flu in the later 20th Century

- 1983 – Avian flu H5N2 in Pennsylvania chicken farms
 - 17 million birds slaughtered (cost = \$65 million)
 - Mortality increased over time!
- 1992 H5N2 in Mexico
 - Not controlled till 1995
- 1997 – Avian flu H5N1 in HK
 - Infected 18 with 6 deaths
 - 1.4 million birds killed
- First known transmission to humans
 - Mutates to become more virulent
- 2001 & 2002 – H5N1 resurfaces in HK
 - live poultry markets – more slaughter
- 2003 – spread continues
 - Netherlands H7N7 in poultry – vet death and 80 eye cases
 - Hong Kong H5N1 case after visiting China, 1 death
 - South Korea
- 2004 – Current avian flu H5N1 outbreak in SE Asia
- 2005 – H5N1 spreading to Europe and Africa

73



The world bank estimates that a bird flu pandemic would cost the global economy \$800 billion/year.



77

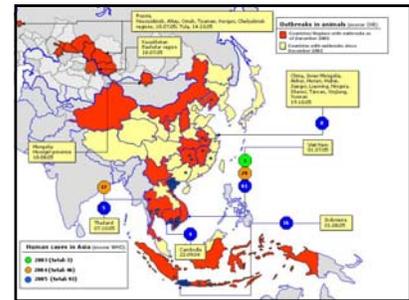


78

Flu Survives in the Environment

- Apart from being highly contagious, avian influenza viruses are readily transmitted from farm to farm by mechanical means
 - Contaminated equipment
 - Vehicles
 - Feed
 - Cages
 - Clothing
- Highly pathogenic viruses can survive for long periods in the environment when temperatures are low
- Normally survives for 24 hrs outside the body

79



Bird Migration Patterns



Why did we kill all those chickens? Antigenic Shift!

- Given enough time and exposure it could mutate
- The genetic material from an old flu virus could mix with genetic material from another strain producing a new virulent virus that is rapidly transmissible
- Without effective preparedness measures we would be virtually defenseless

86

Influenza A Circulation

- In **humans**
 - spread by respiratory-droplet route.
- In **wild aquatic birds**
 - spread by fecal-oral route.
 - This is the origin
 - These animals don't get sick
- In **farm animals**
 - spread by both routes
 - Swine (respiratory-droplet)
 - Chickens and ducks (fecal-oral)

87

Species-to-species Transfer



- **Pigs can harbor both avian and human flu viruses**, setting the stage for potential combination of the two to form a dangerous new strain
- Flu usually starts in the Orient because of the close proximity of pigs and chickens to people

88

Pigs are the key to transmission among humans



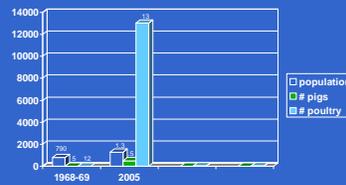
If a pig loses its voice, is it disgruntled?

"There are more pigs, people and poultry in that environment than we've ever seen before. That is the formula for the emergence of new flu strains."

Julie Gerberding
CDC Director

90

China's Growth (millions → billions)



91

In total hundreds of millions of chickens have been culled



92



Where are we today?



Are we in the right place?



95

How would our health care system handle a pandemic of avian flu?

- We don't have enough hospital beds or respirators
- Infection control guidelines are often not followed
- There isn't enough ability to do high throughput testing
- Isolation and quarantine would be brought to new levels

96

Flu & Emergency Rooms

- The annual number of patient visits to ERs is increasing
- The number of ERs is decreasing
- Most ERs are "at" or "over" operating capacity.
- In LA, 6 ER's have recently closed
- In California, 65 ERs have closed in the past decade, and more closed each month

97

What are the economic issues with flu, flu vaccine, and avian flu?



98

The Economics of Flu

- The average worker misses about 1 to 1.5 days a year because of the flu
- \$20 billion per year in lost productivity — depending on the severity of the outbreak
- Employers typically purchase 10 - 20 million flu shots to sponsor flu clinics at work
- Vaccinating healthy Americans against the flu is cost-effective, saving at least \$13.66 per person

99



but economics always involves the government



100

"Government's view of the economy could be summed up in a few short phrases: If it moves, tax it. If it keeps moving, regulate it. And if it stops moving, subsidize it."

- Ronald Reagan

101

The Background for 2004-5 Vaccine Shortage



102

Where the flu vaccine was distributed

About 292 million doses of flu vaccine were delivered worldwide in last year's flu season. Where they went:



Flu Vaccine Doses

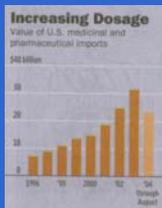
2004-2005: 107-109 million
 - Aventis Pasteur (58 million)
 - Chiron - (46-48 million)
 - MedImmune - (3 million doses of its live nasal spray FluMist)

2005-2006: 88-98 million
 - Sanofi Pasteur (50-60 million doses)
 - Chiron (10-30 million)
 - GlaxoSmithKline (10-15 million)
 - MedImmune (3-5 million)
 - ID Biomedical (3-5 million)

- Drug chains got vaccine
- Private medical offices didn't

104

Imports are going up Manufacturers are going down



105

Vaccine makers have plummeted

- Three years ago, **Wyeth** was making more than 20 million doses of flu vaccines annually. The company decided in 2002 to end its flu vaccine program.
- Two years earlier, **King Pharmaceuticals** ended its program.
- In 2004-5 There are 6 manufacturers in the world producing 200 million doses for other nations but only 2 are licensed to produce vaccine for the US

106

80 percent of the world's measles vaccines come from one company in India



107

Vaccine Effectiveness Varies

- Age
- Immune status
- Vaccine match with circulating strain
- Herd effect

108

How effective is flu vaccine?

Effectiveness

- 80%
- 50-60%
- 70-90%
- 30-40%

Clinical Effect

- Preventing deaths in the elderly
- Preventing hospitalizations >64 yrs
- Reducing/preventing illness in <64 yrs
- Reducing/preventing illness in frail elderly, with underlying disease

109

Questions

- Is it a bit risky for a society to rely purely on free market economics to guarantee a stable and reliable supply of vaccines?
- If you have enough vaccine for hands-on employees or high-risk patients, but not both who should receive the vaccine?"

110

In the last flu season, why did we lose half of our vaccine supply in one swift blow?



111

The Problem

- The excuses
 - Flu vaccine has to be reformulated every year
 - The FDA has a difficult task
 - Companies suffer huge losses if they overestimate the amount that will be needed because they end up having to destroy millions of doses
- The reality
 - We were incredibly stupid

112

Each year the Surgeon General convenes a meeting to decide what should go into the coming year's flu vaccine



113

Flu vaccines are a tricky business

- You have to start manufacturing the vaccine 9 months ahead of the season (Feb – Nov)
- You predict the particular strains that are going to be around a year from now
- Often, millions of doses get thrown away because people don't get vaccinated
- It is not a great business proposition, which is precisely why most American companies don't manufacture it

114

Continuity of Government & Physician Services in Times of Vaccine Shortage

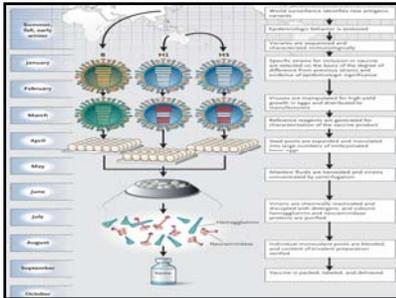
- Should Bush and Cheney be vaccinated?
- Should Congressional staff? They shake many hands
- Is there bioethics in government
- What about physicians and their staff?
- First responders?
- Those with chronic illness?

115

Flu vaccine: the bottom line

- Utilizes technology from the 1950s
- Only 9 countries accounting for 12% of the world's population make vaccine → hoarding
- Annual production is about 300 million trivalent doses
- We would likely need 2 doses if a new strain were to appear
- With today's limited production, <500 million people (14% of the world's population) could be vaccinated within a year

116



What did the current shortage of vaccine teach us?

110

Experience is a wonderful thing. It enables you to recognize a mistake when you make it again.

119

“Do not let what you can not do interfere with what you can do.”

John Wooden

120

Vaccine given to a single patient will protect the individual. Vaccine given to an RN in the ED or the ICU will protect many patients, as one infected RN has the potential of infecting many patients.

121

Vaccination Risk and Rates

- Health care workers
 - All at risk
 - 2/3 unvaccinated
- First responders
 - Vaccination rates vary
- The American population
 - 90 million at risk
 - < half vaccinated

122

For avian flu we would have to add or substitute an H5N1 component and get it through the FDA.

123

Questions about an avian flu vaccine

- Will it work?
- Who will get it?
- When will it be ready?
- Will we have enough?
- How much will it cost?

124

Flu Vaccine: Things to do

- Develop & enhance stockpiles & reserves
- Streamline the regulatory process
- Strengthen liability protection
- Improve communication among stakeholders
- Find better financial incentives for manufacturers

125

Moving from prevention to treatment



126

The art of medicine consists of amusing the patient while nature cures the disease.



Voltaire

Reckless Early Treatment

- Typhoid vaccine
- Quinine
- Morphine
- Opium
- Heroin



- Put them to bed and keep them there
- Nurses > doctors

128

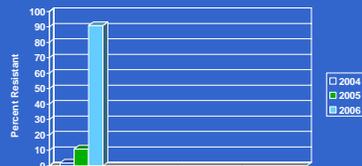
Drugs & Vaccines

- | | |
|-------------------------|-------------------------|
| • Prevention | • Treatment |
| • Killed flu vaccine | • Amantadine |
| • Live flu vaccine | • Rimantidine |
| • Amantidine | • Oseltamivir (Tamiflu) |
| • Rimantidine | • Zanamavir (Relenza) |
| • Oseltamivir (Tamiflu) | |

Resistance

129

Amantadine Resistance in the US



130

What about Tamiflu

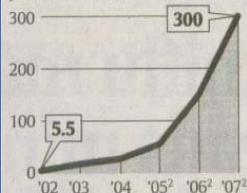
- Will it work?
- Will it divide the epidemic into 2 strains?
- It is only made by one company (Roche) in one plant in one place (Switzerland)

and Roche is still in shock over Vioxx

131

Ramping up

Roche's Tamiflu production by year per treatment¹ (in millions):



1 - One treatment is generally 10 pills over 5 days
2 - Projection

132

Personal pandemic stockpiles: the cons

- Inappropriate use
 - How much to take?
 - How long to take it?
 - When to start and finish taking it?
- Cost
- Depriving those that really need it
 - docs need to treat their high-risk patients who get seasonal flu
 - More indulgence and fad than medical necessity to shorten a bout of the flu by a day or two
- More important uses can be found for a scarce medication than sitting in a medicine cabinet in case you or your loved ones need it some day
- If a pandemic comes, the government might commandeer any Tamiflu that's still available anyway.³³

Distribution Dilemmas

- The choice between national and int'l stockpiles
- The choice between national and personal stockpiles
- Can the feds be trusted?
- Prophylaxis vs. treatment allocation
- Will the Feds will give it to those that need it the most?
- The choice between seasonal and pandemic use
- It will be in your stockpile or someplace else; it will be used to protect you and your loved ones or for some other purpose.

134

Which category are you in?

- **The vulnerable** - treat the most vulnerable flu victims, those likeliest to die if untreated. (The elderly, the immunocompromised, and people with chronic diseases but no one knows yet who the high-risk groups will be in the next pandemic.)
- **The useful** - protect and treat the people we most need to keep healthy in a severe pandemic — healthcare workers, people working on a vaccine; cops; waterworks technicians, morticians, truckers, and others who can help keep society's infrastructure functioning.
- **The rest of the population**

135

Other Confusing Arguments

- What if you are in neither of the first two categories?
- What if your or the government stockpile is never used?
- Would the free market dispose of scarce Tamiflu more effectively than a thought-through government allocation strategy?
- **If used as a treatment the government stockpile won't get to the right people quickly enough. If used as prophylaxis, there won't be enough.**

136

But drugs are not the only answer

- Global and domestic surveillance
- Stockpiles
- Infection control practice
 - At home and at work
 - In crowded places
 - In the hospital

137

How would our current health care system handle an outbreak of avian flu?

- We don't have enough hospital beds or respirators
- Infection control guidelines are often not followed
- There isn't enough ability to do high throughput testing

138

The Federal Pandemic Influenza Preparedness & Response Plan

- A coordinated strategy to prepare for and respond to an influenza pandemic
- Provides guidance to state and local health departments and the health care system

**Is this enough?
Will it work?**

139

What does the plan do?

- Assure and expand vaccine **production** capacity & use
- **Stockpile** antiviral drugs in the Strategic National Stockpile (SNS)
- Enhance U.S. and global disease detection and **surveillance** infrastructures
- Expand influenza-related **research**
- Support public health and **laboratory** planning
- Improve health care system **readiness** at the community level.

140

We will need to know what's going on – and quickly



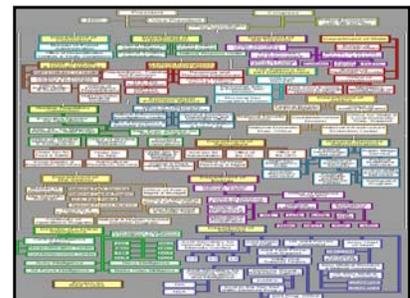
141

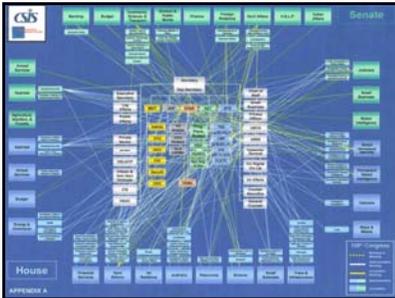
- "I've laid down the law, though, to everyone from now on about anything that happens: no matter what time it is, wake me, even if it's in the middle of a Cabinet meeting."



- Ronald Reagan

142





Consider what this bureaucracy funded last year

- \$199 million for flu research
- \$10 billion for ballistic missile defense
- \$4.5 billion for R&D drawings for the joint strike fighter

- We spend \$19.4 billion per year on R&D and \$20.5 billion on tort litigation
- The capital hill workforce is 30,000 and there are 32,000 lobbyists in DC

The Irony of Priorities

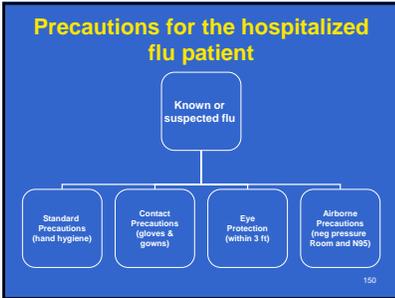
In 2004 the US government spent **\$283 million** on flu research and **\$5.6 billion** on anthrax vaccine research.

Every Institution Needs a Flu Team

- Education
- Have pandemic influenza plan for vaccination allocation and f/u
- Anti-viral stockpile
- Surge capacity plan
- Security for supplies, perimeter
- Dedicated ER area and flu wards
- Increase clinic *staffing and hrs*
- Early d/c patients and cancel elective surgery

Some Practical Points for Patients

- Practice good hand washing.
- Cover your nose and mouth when you sneeze or cough.
- If your child gets sick, don't send him to school.
- If you're sick, don't go to work.
- Avoid crowded places where people are confined in an indoor space.
- Have a plan for caring for family members
- Stock up on personal emergency items, N-95 masks
- Consider the broader financial sequela of a biol disaster



We can't reliably predict the future

- Will there be further dissemination by water sources contaminated with droppings from wild birds?
- Is killing wild birds an appropriate control method vs. monitoring contact between wild birds and poultry?
- Can we stop the smuggling of valuable birds such as fighting cocks, which can prolong or worsen avian flu outbreaks?
- Will we need to watch GI transmission?



We have to stop doing stupid things

- Mailing pandemic strains by accident to labs all over the world
- Having a few manufacturers make all our vaccine
- Causing excess fear in the population about an unquantifiable risk
- Having underfunded, uncoordinated emergency or contingency plans

153

Are we losing the edge on science?

- Spending on R&D
 - vs. legal fees
 - Too politically driven
- Patent lunacy
- Confusing religious practices with scientific findings
- Separating consensus opinion from evidence-based medicine
- Immigration laws scaring students away

154

What to take home

- Avian flu is becoming endemic in Asia, Africa and Europe
- Only 1 case of human-to-human transmission
- Though not currently very contagious, it is still highly lethal
- If airborne flu were to undergo a genetic change making its transmission from person-to-person more efficient, the impact could be global and devastating
- There is no available vaccine yet
- Migratory birds are spreading the virus
- Anyone traveling to SE Asia should stay away from poultry markets and not eat undercooked chicken or runny eggs

155

New Rules

1. Understand the past without obsoledge.
2. Think globally but act locally
3. Be multidisciplinary and networked
4. Efficiently address surge & dual use
5. Reconfigure education
6. Learn to use the media efficiently and ethically
7. Bureaucratically change pyramids to pancakes
8. Act quickly and have a coherent plan
9. Understand that there is an attack on science

156

The End

157